

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 14 May 2001 (14.05.01)	
International application No. PCT/EP00/08531	Applicant's or agent's file reference 2000 ST 104 E
International filing date (day/month/year) 31 August 2000 (31.08.00)	Priority date (day/month/year) 03 September 1999 (03.09.99)
Applicant TONCELLI, Marcello	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 19 March 2001 (19.03.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Mari-José Devillard Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 2000 ST 104 E	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 08531	International filing date (day/month/year) 31/08/2000	(Earliest) Priority Date (day/month/year) 03/09/1999
Applicant TONCELLI, Marcello		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP 00/08531

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

In an improved method for the production of slabs of ceramic material, the starting mixture is enclosed between two sheets of cardboard or paperboard, subjected to vibrating compression under vacuum. The cardboard or paperboard being thick enough to absorb the excess mixture water prior to the transfer to the subsequent drying and firing stages, said sheets of paperboard being removed before said drying stage, so that the rough-formed slab is dried resting solely on a porous fabric or felt, and baking is performed while keeping the dried rough-formed slab in contact with the oven surface solely by means of a temporary protective layer of refractory material (engobe).

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/08531

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B28B7/36 B28B11/24 B28B7/46 B28B3/02 B28B7/44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B28B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 151 533 A (NATENCO AUTOMATION & ROBOTICS) 24 July 1985 (1985-07-24) page 1, line 35 - line 47 ----	1
A	WO 98 46543 A (TONCELLI MARCELLO) 22 October 1998 (1998-10-22) cited in the application claims -----	1-5

☐

Further documents are listed in the continuation of box C.

☒

Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

19 December 2000

Date of mailing of the international search report

28/12/2000

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/08531

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2151533	A	24-07-1985	NONE	
WO 9846543	A	22-10-1998	IT TV970042 A	15-10-1998
			EP 0925264 A	30-06-1999

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International Bureau



(43) International Publication Date
15 March 2001 (15.03.2001)

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WO 01/17741 A1

- (51) International Patent Classification⁷: B28B 7/36, 11/24, 7/46, 3/02, 7/44 (74) Agents: DRAGOTTI, Gianfranco et al.; Dragotti & Associati S.r.l., Via Paris Bordone, 9, I-31100 Treviso (IT).
- (21) International Application Number: PCT/EP00/08531 (81) Designated States (national): CA, US.
- (22) International Filing Date: 31 August 2000 (31.08.2000) (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
- (25) Filing Language: English
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- (30) Priority Data: TV99A000095 3 September 1999 (03.09.1999) IT Published:
— With international search report.
- (71) Applicant and
(72) Inventor: TONCELLI, Marcello [IT/IT]; Via Papa Giovanni XXIII, 2, I-36061 Bassano del Grappa (IT).
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



WO 01/17741 A1

(54) Title: IMPROVED METHOD FOR THE PRODUCTION OF SLABS OF CERAMIC MATERIAL

(57) Abstract: In an improved method for the production of slabs of ceramic material, the starting mixture is enclosed between two sheets of cardboard or paperboard, subjected to vibrating compression under vacuum. The cardboard or paperboard being thick enough to absorb the excess mixture water prior to the transfer to the subsequent drying and firing stages, said sheets of paperboard being removed before said drying stage, so that the rough-formed slab is dried resting solely on a porous fabric or felt, and baking is performed while keeping the dried rough-formed slab in contact with the oven surface solely by means of a temporary protective layer of refractory material (engobe).

"Improved method for the production of slabs of ceramic material"

5 The present invention relates to a method for the manufacture of slabs of ceramic material and, more specifically, to an improvement relating to the method and plant described, illustrated and claimed in Italian patent No. 1,293,176 filed on 15 April 1997 (corresponding to WO-A-9846453) of the same applicant.

10 The slabs of ceramic material to which both the method according to the present invention and that of the above mentioned patent refer are the subject of European patent No. 378,275 and are manufactured from a ceramic mixture consisting of a granulate complying with specific parameters as regards particle size and of an aqueous inorganic binder which has special composition characteristics and for the details of which reference should be made to the text of the aforementioned European patent.

15 During the implementation of said method it was noted that some stages posed certain problems as regards an industrial production, said problems having been solved with the method and plant according to the above mentioned Italian patent.

This latter method and plant envisaged the following operations:

1. Depositing a layer of fabric (felt) onto the moulding support;
2. Arranging a sheet of a paper permeable to water vapour on top of the fabric layer;
- 20 3. Depositing the ceramic mixture onto the sheet of paper, if necessary in two separate stages with insertion, after the first stage, of a mesh of reinforcing material to be embedded in the slab body;
4. Depositing a sheet of rubber onto the layer of mixture;
5. Vibrating compression under vacuum performed above the rubber sheet;
- 25 6. Removal of the rubber sheet;
7. Transfer of the "virgin" slab onto a metal-grid support by means of pincer means gripping the edge of the felt;
8. Drying treatment of the slab;
9. Raising of the dried slab and removal of the fabric layer;
- 30 10. Applying a layer of refractory material (engobe) onto the upper surface of the dried slab (previously lined with the rubber sheet) and drying thereof;
11. Overturning the slab so that it rests on the engobe-lined surface and introduction into the firing kiln, with simultaneous burning of the paper sheet still adhering

to the now visible surface of the dried slab.

The slab thus obtained then undergoes the usual finishing operations, such as sizing, polishing, etc.

5 A major problem during this production process has been that of performing drying of the slab after the moulding phase (namely after vibrating compression under vacuum) in a rapid and as homogeneous as possible manner.

It is obvious that, in order to achieve this object, the surfaces of the moulded slab must be as free as possible and therefore exposed to the action of the drying means (for example hot air).

10 However, the "virgin" slab is necessarily formed on a support capable of withstanding a vibrating compression and cannot be handled before, because of drying it reaches a sufficient degree of rigidity so as to become self-supporting at least for performing the albeit minor handling operations required in order to convey it to the final firing stage.

15 For this reason, the technology applied hitherto and described in the aforementioned Italian patent uses a layer of fabric or felt which allows the passage of the water vapour from the mixture and a sheet of paper arranged between felt and mixture, said sheet performing multiple functions, namely:

- (i) physically separating the mixture from the felt or fabric;
- 20 (ii) absorbing excess water, which is mainly naturally expelled from the mixture layer during the vibrating compression stage, and
- (iii) preventing the formation of folds which are also due to the mixture water and which could result in bending of the final slab.

25 For this reason, the method according to the above mentioned Italian patent uses a thin sheet of paper permeable to water vapour which is arranged above a layer of fabric, preferably felt, which also performs the function of absorbing and allowing the water to pass through during drying.

30 In the practical implementation of this method, the thin sheet of paper, which is completely saturated with water, is preferably treated so that, after drying, it does not form folds which could damage the final slab.

It has now been found, and accordingly is the subject of the present invention, that, by modifying certain stages of the above mentioned method and altering the nature of one of the elements used in the said method, the latter is substantially improved.

These modifications consist mainly in replacing the thin sheet of treated paper with a sheet of paper of considerable thickness, which is usually classified as cardboard or paperboard, depending on the thickness and use, so as to absorb all the excess water without forming folds after vacuum vibro-compression and the drying stage. Herebelow, for the sake of simplicity, this sheet will be simply referred to as "paperboard".

The present invention therefore in its most general definition consists of a method for the production of slabs of ceramic material, of the type in which a mixture of a granulated material and a water-based binder, deposited in a metered quantity on a temporary support, undergoes a stage of vibrating compression under vacuum, followed by a drying stage during which the vibro-compressed mixture is supported by a porous material, and a firing stage, during which the dried slab rests on the firing surface by means of a temporary protective layer of refractory material (engobe), characterised in that said mixture, prior to the stage of vibrating compression under vacuum, is enclosed between two sheets, respectively a first sheet and second sheet, of cardboard or paperboard of sufficient thickness for absorbing the excess mixture water, said sheets being removed prior to said drying stage.

Therefore, the method according to Italian patent 1,293,176 is modified by envisaging the following operations:

1. Depositing a temporary support layer onto the moulding support;
2. Arranging, on top of the temporary support layer, a first sheet of paperboard of suitable thickness for absorbing the excess mixture water;
3. Depositing the ceramic mixture onto the sheet of paper, if necessary in two separate stages with insertion, after the first stage, of a mesh of reinforcing material to be embedded in the slab body;
4. Depositing a second sheet of paperboard, similar to the said first sheet according to step (3), onto the mixture layer;
5. Vibrating compression under vacuum performed above said second sheet of paperboard;
6. Removal of the second sheet of paperboard which is replaced with a layer of porous felt or other material permeable to water vapour in the form of a cloth;
7. Overturning the "virgin", that is rough-formed slab and removing in sequence the said temporary support layer and said first sheet of paperboard;
8. Transferring the slab onto a metal-grid support by means of pincer means

gripping the edge of the porous felt or permeable cloth;

9. Drying treatment of the slab while resting on the said grid by means of the porous felt or permeable cloth;

10. Raising the dried slab and removing the layer of porous felt or permeable cloth;

11. Applying a layer of refractory material (engobe) onto the upper surface of the dried slab and drying thereof;

12. Overturning the layer so that it rests on the engobe-lined surface and introduction into the firing kiln.

10 Comparing this method with the above summarised method according to Italian patent 1,293,176 it is easy to understand the advantages which arise therefrom and which may be summed up in the following points:

15 Firstly, during the drying stage, the bottom surface of the rough-formed or "virgin" slab, i.e. that resting on the layer of cloth or felt, is no longer lined with the thin sheet of paper permeable to water vapour which, no matter how thin, in any case prevents removal of the water vapour.

20 Secondly, before the firing stage, both the surfaces of the dried rough-formed slab are free, therefore allowing application of the layer of refractory material to any one of the two surfaces. On the contrary in the method according to the prior Italian patent one of the surfaces of the dried slab undergoes the firing stage with a thin sheet of paper firmly adhering it, such that removal thereof is performed by means of burning during firing. According to the method according to the present invention, on the other hand, it is possible to decide to which surface the engobe is to be applied. For example, if one of the two surfaces has surface defects, the engobe is applied to the other surface since it is preferable to avoid that the first surface (i.e. the surface with defects) is the surface which is visible in the finished slab and therefore prevent this surface from undergoing excessive sizing in order to eliminate the surface defects.

25 In the practical implementation of the present invention it has been seen that, in place of the cloth or felt support, the temporary support may also consist of rubber (such as a rubberised tape) which is intrinsically more resistant to the stress which is applied during the course of vibrating compression. In fact, as mentioned, this temporary support, at the end of the vacuum compression stage, is removed and does not interfere with the drying stage.

Moreover, a temporary rubber support, which does not come into contact with the mixture and therefore does not require any particular maintenance, may be reused a practically unlimited number of times, while the porous fabric or felt used in the previous method has a limited working life.

5 Finally, the cardboard or paperboard which replaces the thin layer of treated paper according to the prior art is undoubtedly less highly valued and therefore less costly.

As regards the plant described and claimed in Italian patent No. 1,293,176, it may be used to implement the method according to the invention with slight modifications, i.e. the addition of a unit for depositing a layer of porous felt or other rubber-based permeable
10 material onto the rough-formed slab emerging from the vibrating compression under vacuum of a first unit for overturning the slab, for example by means of a pair of sandwich surfaces, downstream of the above porous felt deposition unit, and a unit for removing this porous felt downstream of the drying stage.

Although the invention has been described in relation to a preferred embodiment, it
15 is understood that conceptually and mechanically equivalent modifications and variants are possible and may be envisaged without the scope of the following claims.

Claims

1. Method for the production of slabs of ceramic material, of the type in which a mixture of a granulated material and a water-based binder deposited in a metered quantity on a temporary support, undergoes a stage of vibrating compression under vacuum and then a drying stage, during which the vibro-compressed mixture is supported by a porous material, and a firing stage, during which the dried slab rests on the firing surface by means of a temporary protective layer of refractory material (engobe), characterised in that said mixture, prior to the stage of vibrating compression under vacuum, is enclosed between two sheets, respectively a first sheet and a second sheet, of cardboard or paperboard of sufficient thickness for absorbing the excess mixture water, said sheets being removed prior to said drying stage.

2. Method for the production of slabs of ceramic material according to Claim 1, characterised in that said porous material supporting the vibro-compacted slab during drying is a cloth or felt which is deposited on the upper surface of the vibro-compacted slab after removal of the said second sheet of paperboard so that, following the subsequent overturning of the slab, said porous cloth or felt forms the temporary support for the slab during drying.

3. Method for the production of slabs of ceramic material according to Claim 2, characterised in that said first sheet of paperboard is deposited on a temporary support so that the mixture is deposited on said first sheet of paperboard, said temporary support and said first sheet of paperboard being removed after said vibrating compression stage and after the vibro-compacted slab, the upper surface of which has been lined with said porous cloth or felt, has undergone the said overturning stage prior to the drying stage.

4. Method for the production of slabs of ceramic material according to Claim 3, characterised in that said temporary support consists of a cloth, in particular a felt, or a rubberised tape.

5. Method for the production of slabs of ceramic material according to Claim 2, characterised in that, after said drying stage, the resultant dried rough-formed slab is raised so as to remove said layer of porous felt or other permeable material on which it was resting during drying.

INTERNATIONAL SEARCH REPORT

International Application No.

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- *8* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/08531

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 2151533	A	24-07-1985	NONE	
WO 9846543	A	22-10-1998	IT TV970042 A	15-10-1998
			EP 0925264 A	30-06-1999